Claims

1. A solid-state imaging device with a plurality of pixels having photoelectric conversion elements disposed in a light-receiving region, one or more of the photoelectric conversion elements being subject to a degree of shading from incident light, the improvement comprising:

two or more light detection parts disposed along the periphery of the light-receiving region, each light detection part being capable of outputting a signal corresponding the degree of shading.

2. The solid-state imaging device of claim 1 wherein the two or more light detection parts are disposed along and inside the periphery of the light-receiving region.

3. The solid-state imaging device of claim 1 wherein the two or more light detection parts are disposed along and outside the periphery of the light-receiving region.

4. The solid-state imaging device of claim 1 wherein:

the light-receiving region is divided into an effective pixel part, where output signals of the photoelectric conversion elements are used for image generation, and an available pixel part, where output signals of the photoelectric conversion elements are not used for image generation; and

the photoelectric conversion elements of the pixels included in available pixel part are used as the light detection parts.

5. The solid-state imaging device of claim 4 wherein a light-shielding film having plural specific apertures formed at a plane of incidence side of the available pixel part, each of plural ones of the specific apertures having a center that is offset from the corresponding photoelectric conversion element center by a fixed distance that is predetermined for that pixel.

6. The solid-state imaging device of claim 4 wherein:

a microlens is disposed at each pixel at a plane of incidence of the photoelectric conversion elements in the light-receiving region, each microlens having an optical axis, and

each of plural ones of the microlenses of the available pixel part is disposed so that its optical axis is offset from the corresponding photoelectric conversion element center by a fixed distance that is predetermined for that pixel.

7. The solid-state imaging device of claim 4 wherein:

plural types of color filters are disposed at plural pixels provided in the available pixel part; and

a signal is output from the light detection part indicating the degree of shading at a pixel where a specific color filter is disposed.

8. The solid-state imaging device of claim 4 further including a first output part for reading output signals from pixels in the effective pixel part and a separate second output part for reading output signals from pixels in the available pixel part.

9. The solid-state imaging device of claim 8 wherein:

plural types of color filters are disposed at plural pixels provided in the available pixel part; and

a signal is output from the light detection part indicating the degree of shading at a pixel where a specific color filter is disposed.

10. The solid-state imaging device of claim 8 wherein a light-shielding film having plural specific apertures formed at a plane of incidence side of the available pixel part, each of ones of the specific apertures having a center that is offset from the corresponding photoelectric conversion element center by a fixed distance that is predetermined for that pixel.

11. The solid-state imaging device of claim 10 wherein:

plural types of color filters are disposed at plural pixels provided in the available pixel part; and

a signal is output from the light detection part indicating the degree of shading at a pixel where a specific color filter is disposed.

12: The solid-state imaging device of claim 8 wherein:

a microlens is disposed at each pixel at a plane of incidence of the photoelectric conversion elements in the light-receiving region, each microlens having an optical axis, and

each of plural ones of the microlenses of the available pixel part is disposed so that its optical axis is offset from the corresponding photoelectric conversion element center by a fixed distance that is predetermined for that pixel.

13. The solid-state imaging device of claim 12 wherein:

plural types of color filters are disposed at plural pixels provided in the available pixel part; and

a signal is output from the light detection part indicating the degree of shading at a pixel where a specific color filter is disposed.

14. The solid-state imaging device of claim 12 further comprising a reference pixel that is included in the available pixel part and that does not have a microlens.

15. The solid-state imaging device of claim 13 wherein:

plural types of color filters are disposed at plural pixels provided in the available pixel part; and

a signal is output from the light detection part indicating the degree of shading at a pixel where a specific color filter is disposed.

16. An electronic camera, comprising:

a solid-state imaging device with a plurality of pixels having photoelectric conversion elements disposed in a light-receiving region, one or more of the photoelectric conversion elements being subject to a degree of shading, two or more light detection parts disposed along the periphery of the light-receiving region, each light detection part being capable of outputting a signal corresponding the degree of shading from incident light; and

an image adjustor for adjusting image data based on the signal corresponding to the degree of shading.

17. The electronic camera of claim 16 in which the electronic camera is of a replaceable lens type of single lens reflex electronic camera.

18. The electronic camera of claim 16 wherein:

the light-receiving region is divided into an effective pixel part, where output signals of the photoelectric conversion elements are used for image generation, and an available pixel part, where output signals of the photoelectric conversion elements are not used for image generation; and

the photoelectric conversion elements of the pixels included in available pixel part are used as the light detection parts.

19. The electronic camera of claim 18 in which the electronic camera is of a replaceable lens type of single lens reflex electronic camera.

20. The electronic camera of claim 18 wherein a light-shielding film having plural specific apertures formed at a plane of incidence side of the available pixel part, each of plural ones of the specific apertures having a center that is offset from the corresponding photoelectric conversion element center by a fixed distance that is predetermined for that pixel.

21. The electronic camera of claim 20 in which the electronic camera is of a replaceable lens type of single lens reflex electronic camera.

22. The electronic camera of claim 18 wherein:

a microlens is disposed at each pixel at a plane of incidence of the photoelectric conversion elements in the light-receiving region, each microlens having an optical axis, and

each of plural ones of the microlenses of the available pixel part is disposed so that its optical axis is offset from the corresponding photoelectric conversion element center by a fixed distance that is predetermined for that pixel.

23. The electronic camera of claim 22 in which the electronic camera is of a replaceable lens type of single lens reflex electronic camera.

24. The electronic camera of claim 18 wherein:

plural types of color filters are disposed at plural pixels provided in the available pixel part; and

a signal is output from the light detection part indicating the degree of shading at a pixel where a specific color filter is disposed.

25. The electronic camera of claim 24 in which the electronic camera is of a replaceable lens type of single lens reflex electronic camera.

26. The electronic camera of claim 18 further including a first output part for reading output signals from pixels in the effective pixel part and a separate second output part for reading output signals from pixels in the available pixel part.

27. The electronic camera of claim 26 in which the electronic camera is of a replaceable lens type of single lens reflex electronic camera.

28. The electronic camera of claim 26 wherein:

plural types of color filters are disposed at plural pixels provided in the available pixel part; and

a signal is output from the light detection part indicating the degree of shading at a pixel where a specific color filter is disposed.

29. The electronic camera of claim 26 wherein a light-shielding film having plural specific apertures formed at a plane of incidence side of the available pixel part, each of ones of the specific apertures having a center that is offset from the corresponding photoelectric conversion element center by a fixed distance that is predetermined for that pixel.

30. The electronic camera of claim 29 wherein:

plural types of color filters are disposed at plural pixels provided in the available pixel part; and

a signal is output from the light detection part indicating the degree of shading at a pixel where a specific color filter is disposed.

31: The electronic camera of claim 26 wherein:

a microlens is disposed at each pixel at a plane of incidence of the photoelectric conversion elements in the light-receiving region, each microlens having an optical axis, and

each of plural ones of the microlenses of the available pixel part is disposed so that its optical axis is offset from the corresponding photoelectric conversion element center by a fixed distance that is predetermined for that pixel.

32. The electronic camera of claim 31 wherein:

plural types of color filters are disposed at plural pixels provided in the available pixel part; and

a signal is output from the light detection part indicating the degree of shading at a pixel where a specific color filter is disposed.

33. The electronic camera of claim 31 further comprising a reference pixel that is included in the available pixel part and that does not have a microlens.

34. The electronic camera of claim 32 wherein:

plural types of color filters are disposed at plural pixels provided in the available pixel part; and

a signal is output from the light detection part indicating the degree of shading at a pixel where a specific color filter is disposed.

35. The electronic camera of claim 34 in which the electronic camera is of a replaceable lens type of single lens reflex electronic camera.

36. The electronic camera of claim 34 in which the two or more light detection parts are disposed along and inside the periphery of the light-receiving region.

37. The electronic camera of claim 34 in which the two or more light detection parts are disposed along and outside the periphery of the light-receiving region.

38. An in situ solid-state imaging device shading compensation method providing a shading compensation signal for a solid-state imaging

device with a plurality of pixels having photoelectric conversion elements disposed in a light-receiving region, one or more of the photoelectric conversion elements being subject to a degree of shading from incident light, the method comprising:

obtaining an in situ output signal corresponding the degree of shading from each of two or more light detection parts disposed along the periphery of the light-receiving region, the light detection parts including photoelectric conversion elements of pixels that are not used for image generation.

39. The shading compensation method of claim 38 further comprising directing the incident light through plural specific apertures of a light-shielding film positioned at a plane of incidence side of the two or more light detection parts, each of plural ones of the specific apertures having a center that is offset from the corresponding photoelectric conversion element center by a fixed distance that is predetermined for that pixel.

40. The shading compensation method of claim 38 further comprising:

directing the incident light through a microlens disposed at each pixel at a plane of incidence of the photoelectric conversion elements in the light-receiving region, each microlens having an optical axis, and each of plural ones of the microlenses of the two or more light detection parts being disposed so that its optical axis is offset from the corresponding photoelectric conversion element center by a fixed distance that is predetermined for that pixel.

41. The shading compensation method of claim 38 wherein plural types of color filters are disposed at plural pixels provided in the two or more light detection parts, the method further comprising and outputting from the two or more light detection parts a signal indicating the degree of shading at a pixel where a specific color filter is disposed.

42. The shading compensation method of claim 38 further including providing output signals used for image generation from a first output and providing output signals not used for image generation from a second output separate from the first output.

43. The shading compensation method of claim 38 in which the two or more light detection parts are disposed along and inside the periphery of the light-receiving region.

44. The shading compensation method of claim 38 in which the two or more light detection parts are disposed along and outside the periphery of the light-receiving region.